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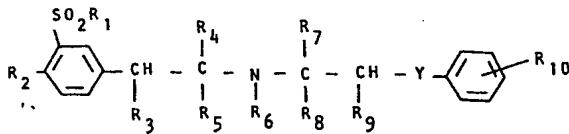
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(54) Sulfamoyl-substituted phenethylamine derivatives, their preparation, and pharmaceutical compositions, containing them.

(57) A sulfamoyl-substituted phenethylamine derivative represented by the general formula



wherein R₁ represents an amino group or a mono- or di-lower alkylamino group; R₂ represents a hydroxyl group, a lower alkyl group, or a lower alkoxy group; R₃ represents hydrogen, halogen, a lower alkyl group, a lower alkoxy group, a phenylthio group, or a phenylsulfinyl group; R₄, R₅, R₆, R₇, R₈, and R₉ are selected independently from hydrogen and lower alkyl groups; R₁₀ represents hydrogen, a lower alkyl group, or a lower alkoxy group; and Y represents oxygen or a methylene group and is oxygen when R₁ is a hydroxyl group; or a salt thereof. The compounds exhibit α-adrenergic blocking action and are useful as antihypertensive agents and for the treatment of congestive heart failure. In the preferred compounds according to the invention R₃ is hydrogen or lower alkyl.

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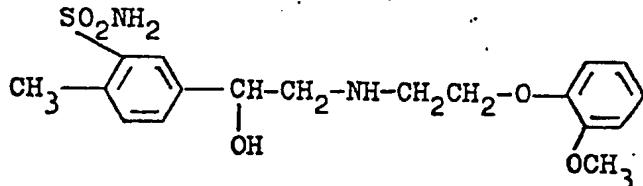
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SULFAMOYL-SUBSTITUTED PHENETHYLAMINE
DERIVATIVES, THEIR PREPARATION, AND
PHARMACEUTICAL COMPOSITIONS, CONTAINING
THEM

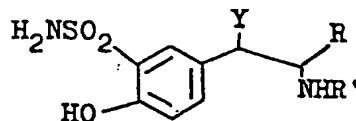
This invention relates to sulfamoyl-substituted phenethylamine derivatives and acid addition salts thereof, their preparation, and their pharmaceutical use. Compounds according to the invention exhibit α -adrenergic blocking action and can be used as antihypertensive agents and for treating congestive heart failure.

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British Patent No. 2,006,772 discloses a series of compounds exhibiting α - and β -adrenergic blocking actions and that the compound shown by the following formula exhibits strong α - and β -adrenergic blocking actions



U. S. Patent No. 3,860,647 discloses a series of compounds shown by the following general formula

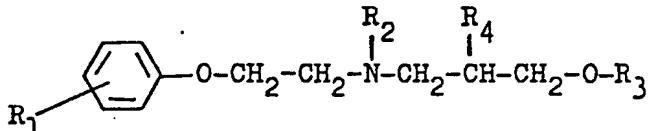


wherein R represents hydrogen or alkyl having 1-4 carbon atoms; R' represents alkyl having 1-6 carbon atoms, cycloalkyl having 3-6 carbon atoms, $XC_6H_4(CH_2)_2CH(CH_3)$, $XC_6H_4(CH_2)_2C(CH_3)_2$, $XC_6H_4CH_2CH(CH_3)$, or $XC_6H_4CH_2C(CH_3)_2$ (wherein X represents

15

hydrogen, hydroxyl or methoxy); and Y represents hydrogen or hydroxy. It is disclosed in this U.S. Patent that these compounds exhibit β -adrenergic blocking action.

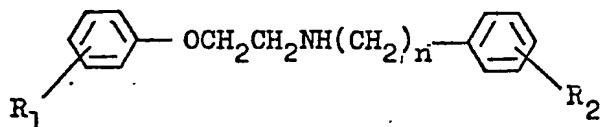
British Patent No. 902,617 discloses a series of compounds shown by the following general formula



wherein R_1 is hydroxyl, methyl, methoxy, etc.; R_2 is hydrogen, methyl, etc.; R_3 is phenyl, benzyl or a hydroxy-, methyl-, methoxy-, ethoxy-, chloro- or bromo-substituted phenyl or benzyl radical, etc.; and R_4 is hydrogen, etc.

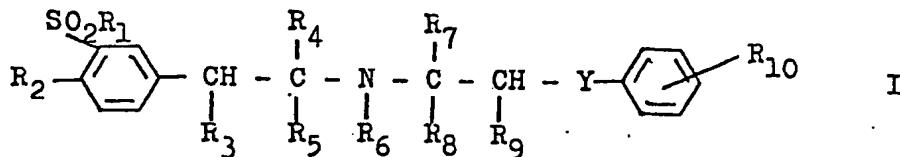
These compounds exhibit α -adrenergic blocking action (see, "J. Med. Chem."; 9, 812-818(1966)) and possess antihypertensive activity.

Also, in "J. Med. Chem."; 9, 812-818(1966), it is disclosed that the phenoxyethylamine-type compounds shown by the following general formula possess α -adrenergic blocking action



wherein R_1 represents \underline{o} - OCH_3 , etc., and R_2 represents \underline{o} - or p - OCH_3 , etc.

According to this invention there are provided sulfamoyl-substituted phenethylamine derivatives shown by following general formula I:



wherein R_1 represents an amino group or a mono- or di-lower alkylamino group; R_2 represents a hydroxyl group, a lower alkyl group, or a lower alkoxy group; R_3 represents hydrogen, halogen, a lower alkyl group, a lower alkoxy group, a phenylthio group, or a phenylsulfinyl group; R_4 , R_5 , R_6 , R_7 , R_8 and R_9 are selected independently from hydrogen and lower alkyl groups; R_{10} represents hydrogen, a lower alkyl group, or a lower alkoxy group; and Y represents oxygen or a methylene group and is oxygen when R_2 is a hydroxyl group; and acid addition salts thereof.

The term "lower" used herein

means a straight or branched carbon chain having 1 to 5 carbon atoms. For example, "lower alkyl group" includes methyl, ethyl, propyl, butyl, pentyl and isobutyl groups, etc.; and "lower alkoxy group" includes methoxy, ethoxy, propoxy and butoxy groups, etc.

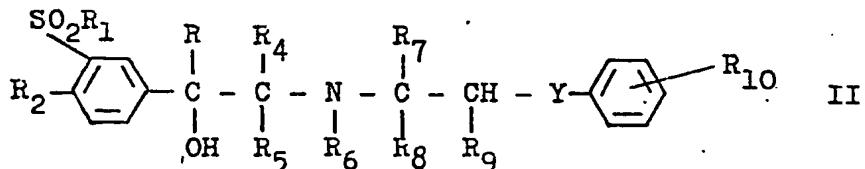
Also, in the above-described formula, R₁₀ which is a substituent of the benzene ring may be disposed at any position ortho-, meta- or para- to the side chain. Furthermore, since the compounds of this invention shown by formula I can readily form salts and contain asymmetric carbon atom(s), the invention includes the salts thereof, and any optically active or inactive isomer or isomer mixture thereof.

The compounds of the present invention exhibit α -adrenergic blocking action and thus can be utilized for various treatments. For example, they can be used for the treatment of hypertension, congestive heart failure, angina pectoris, lower urinary tract dysfunction, prostatic hypertrophy, pheochromocytoma and peripheral vascular disorders.

The compounds of this invention shown by formula I can be produced by the following processes.

Process 1:

A compound of formula I is obtainable by reacting a compound shown by general formula II

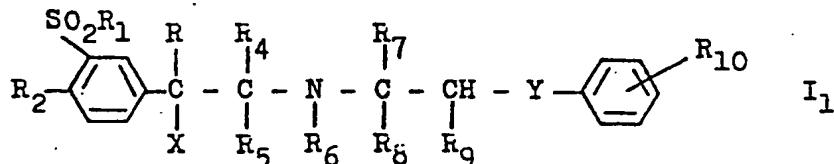


wherein R represents hydrogen or a lower alkyl group and

R_1 , R_2 , R_4 , R_5 , R_6 , R_7 , R_8 , R_9 , R_{10} and Y have the same significance as in formula I

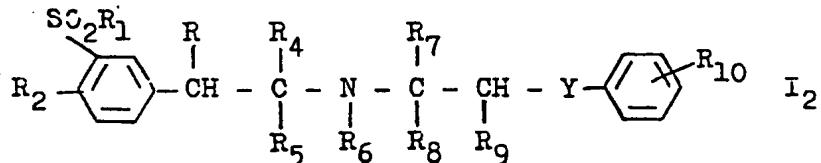
with halogenating agent and then, if desired, (a) reducing the halogenated product obtained by the above reaction; or (b) reacting the halogenated product with alkaline material and then reacting the product thus obtained with hydrogen iodide, a lower alcohol, or thiophenol, and further, if desired, oxidizing the product obtained by the reaction with thiophenol.

In process I a starting material shown by formula II described above can be reacted with halogenating agent to provide a product shown by general formula I_1



wherein X represents chlorine or bromine and R , R_1 , R_2 , R_4 , R_5 , R_6 , R_7 , R_8 , R_9 , R_{10} and Y have the same significance as in formula II

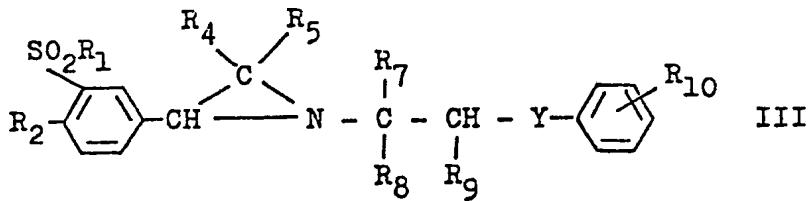
and then, if desired, (a) the halogenated product shown by formula I_1 is reduced to form a compound shown by formula I_2



wherein R , R_1 , R_2 , R_4 , R_5 , R_6 , R_7 , R_8 , R_9 , R_{10} and Y have the same significance as above described;

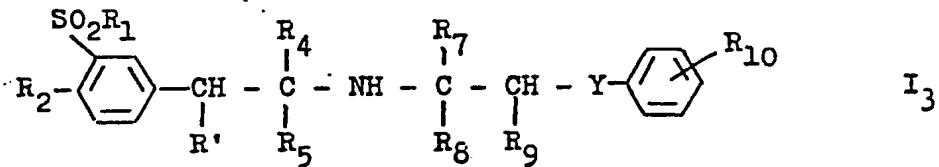
or (b) the halogenated product shown by formula I_1 is treated with alkaline material to form the aziridine compound shown

by following general formula III



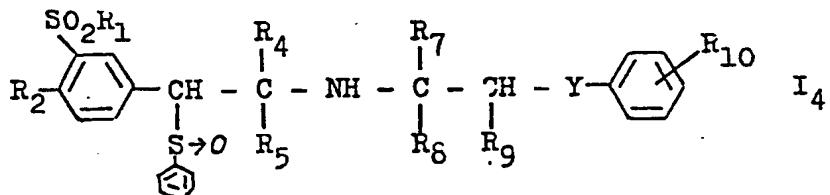
wherein R_1 , R_2 , R_4 , R_5 , R_7 , R_8 , R_9 , R_{10} and Y have the same significance as above described, and

- then the aziridine compound is reacted with hydrogen iodide,
 5 a lower alcohol, or thiophenol to provide the compound shown by general formula I₃



wherein R' represents iodine, a lower alkoxy group or a phenylthio group and R_1 , R_2 , R_4 , R_5 , R_7 , R_8 , R_9 , R_{10} and Y have the same significance as above described;

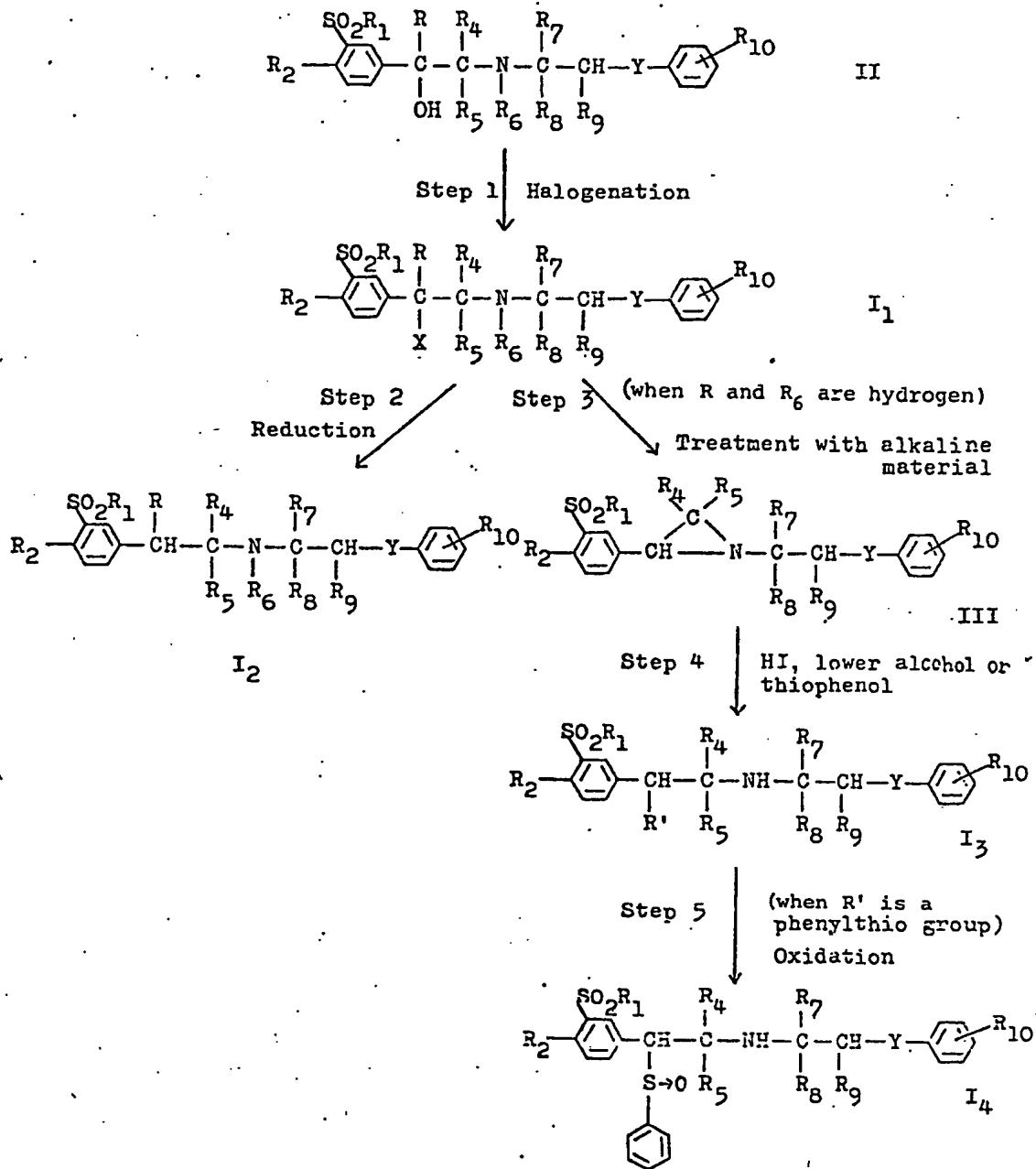
- 10 further, when R' of the compound shown by formula I₃ is a phenylthio group the compound can be oxidized to provide the compound shown by general formula I₄



wherein R_1 , R_2 , R_4 , R_5 , R_7 , R_8 , R_9 , R_{10} and Y have the same significance as above described.

- 15 This process is further schematically shown below, the compounds shown by formulae I₁, I₂, I₃ and I₄ being compounds according to this invention.

- 7 -



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The reaction conditions in the steps described above may be as follows:

Step 1: The halogenation of the compounds of formula II can be performed in an organic solvent such as
5 toluene, methyl ethyl ketone, acetonitrile, tetrahydrofuran, etc., at room temperature or under heating using a halogenating agent such as thionyl chloride, hydrogen chloride, hydrogen bromide, phosphorus trichloride, phosphorus pentachloride, phosphorus oxychloride, thionyl bromide, etc.

10 Step 2: The reduction of the compounds of formula I₁ can be performed in an organic solvent such as methanol, ethanol, toluene, acetonitrile, tetrahydrofuran, etc., under hydrogen stream, at normal temperature and
15 normal pressure using a catalyst such as platinum oxide, palladium carbon, etc.

Step 3: The compounds of formula III can be obtained by
20 treating the compounds of formula I₁ (wherein, however, R and R₆ are hydrogen) with an alkaline material such as sodium carbonate, metal alcoholate, sodium hydroxide, potassium hydroxide, etc., in an organic solvent such as ethyl acetate, ^{ethanol}, dioxane, benzene, etc., at room temperature to 50°C.

Step 4:
25 i): The compounds of formula I₃ (wherein R' is a phenylthio group) can be obtained by reacting the compounds of formula III with thiophenol in an organic solvent such as methanol, chloroform, ethyl

acetate, dioxane, benzene, etc., at room temperature.

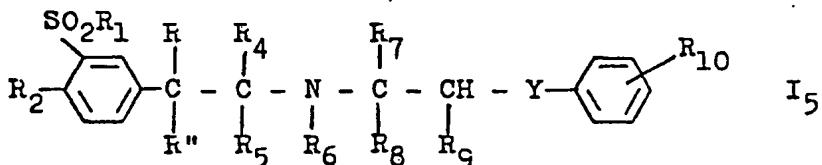
ii): The compounds of formula I₃ (wherein R' is a lower alkoxy group) can be obtained by reacting the

compounds of formula III with a lower alcohol in the presence of BF₃ catalyst under the same condition as in the step i).

iii): The compounds of formula I₃ (wherein R' is iodine) can be obtained by reacting the compounds of formula III with hydroiodic acid in an organic solvent such as dioxane, methanol, etc., at room temperature.

Step 5: The oxidation of the compounds of formula I₃ (wherein R' is a phenylthio group) can be performed in acetic acid at temperatures of 50-60°C using H₂O₂ as the oxidizing agent.

In addition, among the compounds of this invention, the compounds shown by following general formula I₅



wherein R'' represents a lower alkoxy group or a phenylthio group and R, R₁, R₂, R₄, R₅, R₆, R₇, R₈, R₉, R₁₀ and Y have

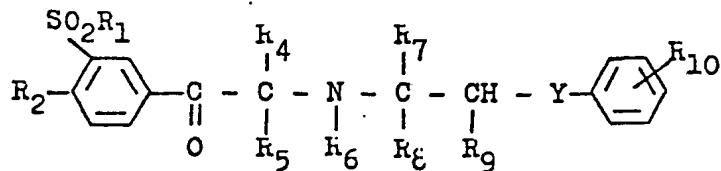
the same significance as above described

can be obtained by reacting the compounds of formula I₁ directly with a lower alcohol or thiophenol.

The starting materials of formula II wherein R is hydrogen used in the process of this invention are described in

British Patent No. 2,006,772; the starting materials of

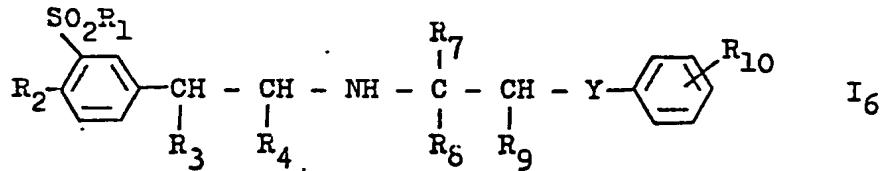
formula II wherein R is a lower alkyl group can be obtained by reacting the compounds of the following formula



described in the aforesaid British patent with a Grignard reagent (lower alkyl-MgX).

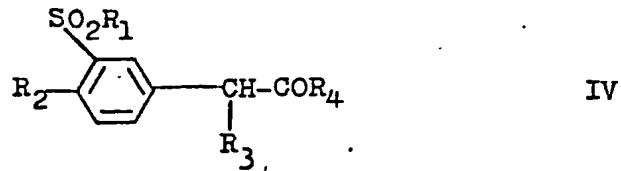
5. Process 2:

A compound of this invention shown by following general formula I₆

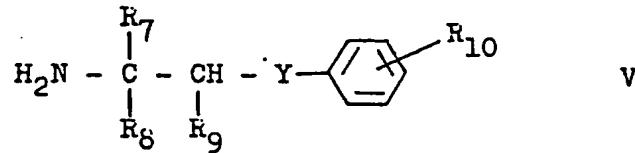


wherein R₁, R₂, R₃, R₄, R₇, R₈, R₉, R₁₀ and Y have the same significance as in formula I

10 can be produced by condensing the compounds shown by the general formulae



and



and then reducing the product thus obtained.

This reaction is performed by condensing the compounds
15 of formulae IV and V in an organic solvent

such as methanol, ethanol, toluene, acetonitrile, tetrahydrofuran, etc., and then reducing the product, e.g. in the presence of PtO₂ catalyst or Raney nickel catalyst or with NaBH₄, LiAlH₄, etc.

The isolation and purification of the compounds of this invention shown by general formulae I₁-I₆ and formed by Process I or 2 may be effected by filtration, extraction with a solvent, separation by column chromatography, recrystallization, etc.

The pharmacological effects of compounds of this invention were determined by the following experiments. The effects of compounds of this invention were compared with those of 5-{1-hydroxy-2-[(2-methoxyphenoxy)ethylamino]ethyl}-2-methylbenzenesulfonamide (Compound A, which is one of the typical compounds presented in British Patent No. 2,006,772) and of phentolamine.

A. α -Adrenergic blocking action:

The blood pressure was measured in rats anesthetized with urethane and treated with pentolinium. The effects of the test samples (intravenous injection - i.v.) on the hypertensive response to phenylephrine (10 µg/Kg i.v.) were measured and the results are shown in Table I.

B. Antihypertensive effects in spontaneously hypertensive rats:

Oral administration (p.o.): The systolic blood pressure of spontaneously hypertensive rats having systolic blood pressure higher than 150 mmHg was measured indirectly by the tail cuff method using a programmed electrosphygmomanometer (Narco Bio-Systems Inc., PE-300), the results being shown in Table II.

Table I α -Adrenergic blocking action:

	Sample	α -adrenergic blocking ED_{50} (mg/Kg) i.v.
Compounds of this invention (Ex. No.)		
	4	0.00035
	5	0.00026
15	10	0.0059
	11	0.012
	12	0.0073
	15	0.0013
	16	0.0008
20	20	0.00000014
	25	0.0012
	26	0.004
Known compounds		
	Compound A	0.034
25	Phentolamine	0.061

Table II Antihypertensive effect:

Sample	Dose (mg/Kg)	Change in systolic blood pressure (mmHg) at stated dose p.o.
Compounds of this invention (Ex. No.)		
10	10	-57± 5.6
11	30	-50± 4.7
12	10	-48± 2.0
15	10	-54± 6.2
16	10	-71± 11.1
20	3	-57± 4.2
25	10	-46± 3.6
26	10	-46± 4.3
Known compounds		
Compound A	10	-35± 6.4
Phentolamine	10	+7.8± 5.0
"	100	-70± 10.1

The clinical administration of the compounds of this invention is usually practiced by intravenous injection or orally as the free bases or the acid addition salts thereof (e.g. hydrochlorides, sulfates, maleates, acetates, furoates, lactates, citrates, etc.). It is appropriate to administer 10 ng - 1 mg doses of the compound several times per day in the case of intravenous administration, or 0.1 - 100 mg of the compound two or three times per day in the case of oral administration.

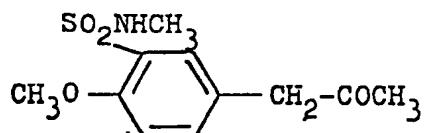
10 The compounds of this invention may be formulated into ordinary dosage forms such as, for example, tablets, capsules, pills, solutions, etc., and these medicaments can be prepared by conventional methods using usual medical excipients.

15 The production of compounds of this invention is illustrated in the following Examples.

In addition, the raw materials used in this invention include novel compounds and the production thereof is shown in Reference Examples.

- 15 -

Reference example 1.



(1) To 250 g of chlorosulfonic acid was added dropwise 50 g of 4-methoxyphenylacetone at 0-5°C. After stirring the mixture for 4 hours at room temperature, the reaction mixture was poured into 2,500 ml of ice water and extracted thrice with 500 ml of ethyl acetate. The extract was washed with water and after drying the extract with anhydrous magnesium sulfate, the solvent was distilled off under reduced pressure. The crude crystals obtained were recrystallized from benzene-ether to provide 32 g of 3-chlorosulfonyl-4-methoxyphenylacetone.

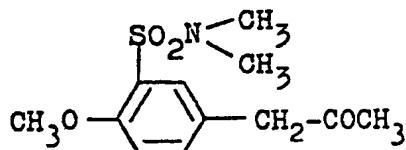
Melting point: 80-81°C

(2) In 26 ml of tetrahydrofuran was dissolved 2.6 g of 3-chlorosulfonyl-4-methoxyphenylacetone and then 1.2 g of 40% methylamine was added dropwise to the solution at a temperature lower than 10°C. After stirring the mixture for one hour at room temperature, the solvent was distilled off under reduced pressure and the residue was extracted with ethyl acetate. The extract was washed with water and after drying with anhydrous

magnesium sulfate, the solvent was distilled off under reduced pressure. The crude crystals obtained were recrystallized from isopropanol-ether to provide 1.8 g of 4-methoxy-3-N-methylsulfamylphenylacetone.

Melting point: 100-101°C.

Reference example 2.



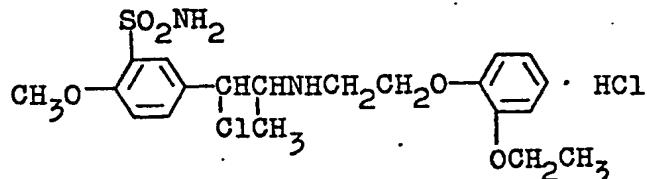
By reacting 2.6 g of 3-chlorosulfonyl-4-methoxyphenylacetone and 0.6 g of dimethylamine in the same manner as in Reference example 1-(2), 2.5 g of oily 4-methoxy-3-N,N-dimethylsulfamylphenylacetone was obtained.

Nuclear magnetic resonance spectra (CDCl₃):

- δ: 2.18 (3H, S, COCH₃)
2.82 (6H, S, N(CH₃)₂)
3.69 (2H, S,)
3.90 (3H, S, O-CH₃)

15

Example 1



In 1,000 ml of acetonitrile was suspended 17 g of 5-{2-[2-(2-ethoxyphenoxy)ethylamino]-1-hydroxy-2-methylethyl}-2-methoxybenzenesulfonamide hydrochloride and while stirring the suspension, 20 9 g of thionyl chloride was added dropwise to the suspension

at room temperature, whereby the product first dissolved and then began to crystallize gradually. After stirring the mixture for two days, the crystals formed were recovered by filtration, washed with chloroform and dried to provide 15 g of 5-{1-chloro-2-[2-(2-ethoxyphenoxy)ethylamino]-2-methylethyl}-2-methoxybenzenesulfonamide hydrochloride.

The product has the following physicochemical properties:

Melting point: 197-200°C

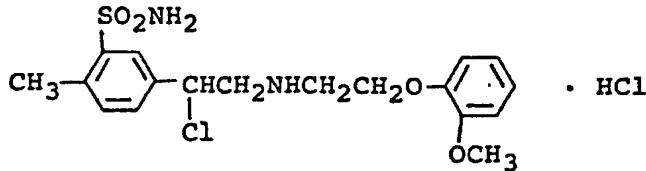
Elemental analysis for $C_{20}H_{27}N_2O_5S\text{Cl} \cdot H\text{Cl}$:

	C(%)	H(%)	N(%)
Calcd.:	50.11	5.89	5.84
Found :	50.06	5.96	5.95

Nuclear magnetic resonance spectra (CD_3OD):

δ :	1.30	(3H, d, $CH-CH_3$)
	1.40	(3H, t, CH_2-CH_3)
	3.63	(2H, t, CH_2-CH_2-N)
	4.01	(3H, s, $O-CH_3$)
	4.12	(2H, q, CH_3-CH_2-O)
	4.36	(2H, t, CH_2-CH_2-O)
	5.30	(1H, d, $Cl-CH$)

The compounds in Examples 2 and 3 were obtained in the same manner as in Example 1.

Example 2

5-[1-Chloro-2-[2-(2-methoxyphenoxy)ethylamino]ethyl]-2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

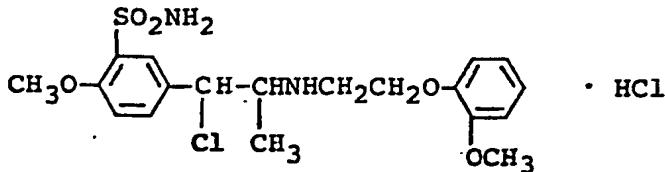
Melting point: 190-191°C

Elemental analysis for $C_{18}H_{23}N_2O_4SCl \cdot HCl$:

	C (%)	H (%)	N (%)
Calculated:	49.66	5.56	6.43
Found:	49.51	5.70	6.53

Nuclear magnetic resonance spectra (d_6 -DMSO):

δ : 2.61 (3H, s, ---CH_3), 3.64 (3H, s, ---OCH_3)
 5.66 (1H, m, ---CH---Cl)

Example 3

5-[1-Chloro-2-[2-(2-methoxyphenoxy)ethylamino]-2-methylethyl]-2-methoxybenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 195-197°C (decomposed)

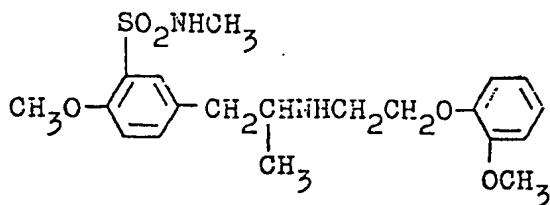
Elemental analysis for $C_{19}H_{25}N_2O_5SCl \cdot HCl$:

	C (%)	H (%)	N (%)
Calculated:	49.04	5.63	6.02
Found:	49.02	5.64	6.08

Nuclear magnetic resonance spectra ($CD_3OD + d_6$ -DMSO):

δ : 1.18 (3H, d, ---CH---CH_3)
 3.80 and 3.95 (3H + 3H, s, ---O---CH_3)
 5.56 (1H, d, ---CH---Cl)

Example 4



A mixture of 1.4 g of 4-methoxy-3-N-methylsulfamylphenylacetone, 1 g of 2-methoxyphenoxyethylamine, and 30 ml of methanol was refluxed for one hour. After cooling the mixture, 60 mg of a platinum oxide catalyst was added thereto, and reduction was performed at normal temperature and pressure. After absorption of a theoretical amount of hydrogen, the catalyst was filtered away. After the filtrate was acidified with alcoholic 5% hydrochloric acid, the solvent was 10 distilled off under reduced pressure to form 1.6 g of crystals, which were recovered and recrystallized to provide 1.2 g of the colorless crystals of 2-methoxy-5-[2-(2-methoxyphenoxy)ethylamino]-2-methylethyl-N-methylbenzenesulfonamide hydrochloride.

15 The product has the following physicochemical properties:

Melting point: 162-163°C.

Elemental analysis for $C_{20}H_{28}N_2O_5S \cdot HCl$:

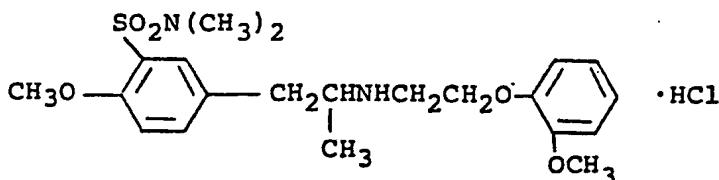
	C(%)	H(%)	N(%)
Calcd.:	53.99	6.57	6.30
Found :	53.85	6.70	6.27

20 Nuclear magnetic resonance spectra (d_6 -DMSO):

δ : 1.15 (3H, d, $-\underline{CHCH}_3$)
3.76 and 3.88 (3H + 3H, s, $O-\underline{CH}_3$)

The compound of Example 5 was obtained in the same manner as in Example 4.

Example 5



2-Methoxy-5-{2-[2-(2-methoxyphenoxy)ethylamino]-2-methylethyl}-N,N-dimethylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 185-187°C

Elemental analysis for C₂₁H₃₀N₂O₅S·HCl:

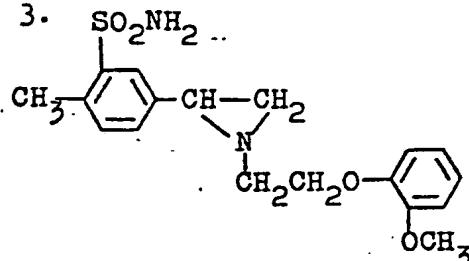
	C (%)	H (%)	N (%)
Calculated:	54.95	6.81	6.10
Found:	54.73	6.88	5.85

Nuclear magnetic resonance spectra (d₆-DMSO):

δ: 1.16 (3H, d, CHCH₃), 2.71 (6H, s, N(CH₃)₂)

3.76 and 3.87 (3H + 3H, s, -O-CH₃)

Reference example 3.



In 50 ml of ethyl acetate was suspended 4.35 g (0.01 mole) of 5-{1-chloro-2-[2-(2-methoxyphenoxy)ethylamino]ethyl}-2-methylbenzenesulfonamide hydrochloride and then 50 ml of an aqueous 10% sodium carbonate solution was added to the suspension with stirring. After further stirring overnight vigorously, the reaction mixture was recovered by decantation. After removing inorganic matter by passing the ethyl acetate layer thus recovered through a silica gel column (50 ml of silica gel), the reaction product was evaporated to dryness to provide 3.2 g (88%) of colorless resinous 5-{1-[2-(2-methoxyphenoxy)-ethyl]aziridin-2-yl}-2-methylbenzenesulfonamide.

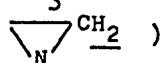
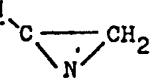
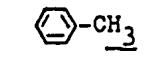
The product has the following physicochemical properties:

Amorphous form.

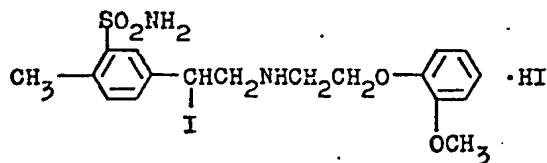
Elemental analysis for $C_{18}H_{22}N_2O_4S$:

	C(%)	H(%)	N(%)
5	Calcd.: 59.65	6.12	7.73
	Found : 59.37	6.12	7.61

Nuclear magnetic resonance spectra ($CDCl_3$):

	δ : 1.74 and 1.95 (1H + 1H, d, 
	2.43 (1H, q, 
10	2.55 (3H, s, 
	4.10 (2H, t, O-CH ₂ -)

Example 6



In 50 ml of dioxane was dissolved 2.5 g of 5-[1-*l*-2-(2-methoxyphenoxy)ethyl]aziridin-2-yl]-2-methylbenzenesulfonamide
 15 and after adding thereto 1 g of concentrated hydroiodic acid,
 the mixture was stirred overnight. After the reaction was
 over, the solvent was distilled off under reduced pressure and
 the residue was washed thrice with 30 ml of water and then
 200 ml of ether and crystallized by the addition of ethyl
 20 acetate. The crystals were recovered by filtration, washed
 with water, and dried to provide 1.7 g of 5-[1-iodo-2-*l*-2-(2-
 methoxyphenoxyamino)ethyl]-2-methylbenzenesulfonamide hydroiodide.

The product has the following physicochemical properties:

Melting point: 154-155°C.

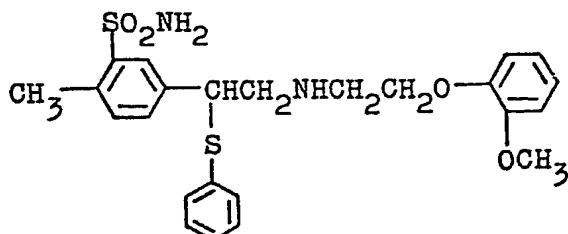
Elemental analysis for C₁₈H₂₃N₂O₄Si.HI:

C(%)	H(%)	N(%)
Calcd.: 34.97	3.91	4.53
Found : 35.07	3.98	4.39

Nuclear magnetic resonance spectra (CD₃OD):

- δ : 2.65 (3H, s, C_6H_3)
3.54 (2H, t, $-\text{CH}_2-\text{N}-$)
4.30 (2H, t, $-\text{CH}_2-\text{O}$)
5.55 (1H, t, $>\text{CH-I}$)

Example 7



In 50 ml of methanol was dissolved 2.5 g of 5-{1-[2-(2-methoxyphenoxy)ethyl]aziridin-2-yl}-2-methylbenzenesulfonamide and after adding 1 g of thiophenol to the solution and stirring the mixture overnight at room temperature, methanol was distilled off. The residue was subjected to silica gel column chromatography and the product was eluted by a mixed solvent of chloroform and methanol (9 : 1 by volume ratio) to provide 2.4 g of 5-{2-[2-(2-methoxyphenoxy)-ethylamino]-1-phenylthioethyl}-2-methylbenzenesulfonamide as a viscous oily material.

The product has the following physicochemical properties:

Amorphous form.

Elemental analysis for $C_{24}H_{26}N_2O_4S_2$:

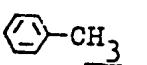
C(%)	H(%)	N(%)
------	------	------

Calcd.: 60.99	5.97	5.93
---------------	------	------

5

Found : 60.72	6.11	5.71
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Nuclear magnetic resonance spectra ($CDCl_3$):

δ : 2.58 (3H, s, )

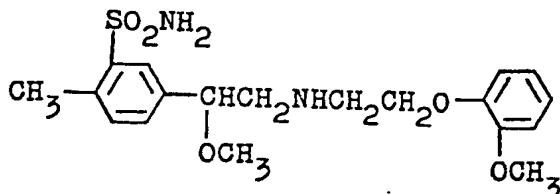
3.74 (3H, s, O-)

3.98 (2H, t, -)

10

4.35 (1H, t, >)

Example 8



In 50 ml of methanol was dissolved 2.5 g of 5-{1-[2-(2-methoxyphenoxy)ethyl]aziridin-2-yl}-2-methylbenzenesulfonamide and after adding thereto 2 ml of a boron trifluoride ether complex at room temperature, the mixture was stirred overnight. Thereafter, methanol was distilled off under reduced pressure and the residue was subjected to silica gel column chromatography and eluted with a mixed solvent of chloroform and methanol (9 : 1 by volume ratio), whereby 1.5 g of a colorless viscous oily material was obtained. The product was crystallized by the addition of 5 ml of methanol and several drops of ammonia. The crystals formed were recovered by filtration, washed with water, and dried to provide 1.2 g of

20

5-{1-methoxy-2-[2-(2-methoxyphenoxy)ethylamino]ethyl}-2-methylbenzenesulfonamide.

The product has the following physicochemical properties:

Melting point: 150-152°C.

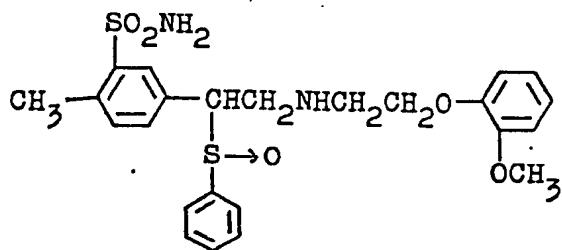
Elemental analysis for C₁₉H₂₆N₂O₅S:

	C(%)	H(%)	N(%)
Calcd.:	57.85	6.64	7.10
Found :	57.58	6.79	7.24

Nuclear magnetic resonance spectra (CD₃OD):

δ:	2.65	(3H, s,)
	2.98	(2H, t,)
	3.80	(3H, s,)
	3.26	(3H, s,)
	4.10	(2H, t,)
	4.40	(1H, q, >CH-O)

Example 9



In 20 ml of acetic acid was dissolved 2 g of 5-{2-[2-(2-methoxyphenoxy)ethylamino]-1-phenylthioethyl}-2-methylbenzenesulfonamide and after adding thereto 0.5 ml of 30% H₂O₂, the mixture was heated to 50-60°C for 3 hours. After adding thereto 100 ml of water, the reaction mixture was extracted with 200 ml of ethyl acetate.

The ethyl acetate extract

was washed with an aqueous 1% sodium carbonate solution and then ethyl acetate was distilled off under reduced pressure. The residue was subjected to silica gel column chromatography, the product was eluted with a mixed solvent of chloroform and methanol (9 : 1 by volume ratio), and the colorless viscous oily product thus obtained was crystallized by the addition of ethyl acetate. The crystals formed were recovered by filtration to provide 1.3 g of 5-{2-[2-(2-methoxyphenoxy)-ethylamino]-1-phenylsulfinylethyl}-2-methylbenzenesulfonamide.

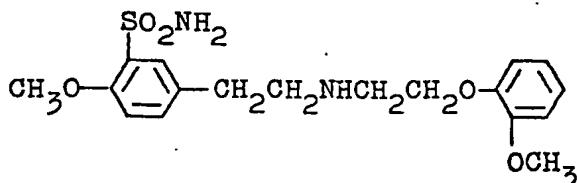
The product has the following physicochemical properties:

Melting point: 139-141°C

Elemental analysis for C₂₄H₂₈N₂O₅S₂:

	C(%)	H(%)	N(%)
Calcd.:	59.00	5.78	5.73
Found :	58.91	5.74	5.72

Example 10



In 150 ml of methanol was dissolved 3.8 g of 5-{1-chloro-2-[2-(2-methoxyphenoxy)ethylamino]ethyl}-2-methoxybenzenesulfonamide hydrochloride and after adding thereto 0.5 g of

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10% palladium carbon, dechlorination was performed under hydrogen stream at normal temperature and pressure. The palladium carbon was filtered away and the filtrate was concentrated under reduced pressure to provide 3.1 g of 2-methoxy-5-{2-[2-(2-methoxyphenoxy)ethylamino]ethyl} benzene-sulfonamide hydrochloride, which was recrystallized from 120 ml of a mixture of methanol and ethanol (1 : 4 by volume ratio) to provide 2.3 g of the colorless crystals thereof.

The product has the following physicochemical properties:

Melting point: 196-198°C

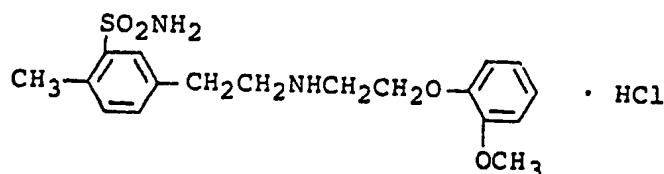
Elemental analysis for $C_{18}H_{24}N_2O_5S \cdot HCl$:

	C(%)	H(%)	N(%)
Calcd.:	51.86	6.04	6.72
Found :	51.72	6.23	6.68

Nuclear magnetic resonance spectra (CD_3OD):

δ : 3.84 and 3.98 (3H + 3H, s, $-OCH_3$)
4.24 (2H, t, $-OCH_2-$)

The compounds in Examples 11-29 were obtained in the same manner as in Example 10.

Example 11

5-[2-(2-Methoxyphenoxy)ethylamino]ethyl-2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

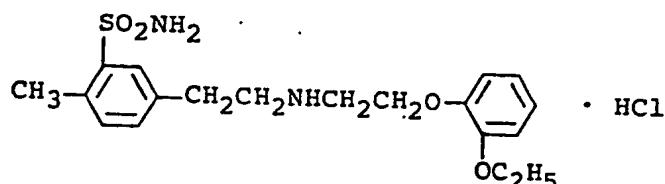
5 Melting point: 173-175°C

Elemental analysis for $C_{18}H_{24}N_2O_4S \cdot HCl$:

	C(%)	H(%)	N(%)
Calculated:	53.93	6.28	6.99
Found:	53.83	6.27	6.97

10 Nuclear magnetic resonance spectra (CD_3OD):

δ : 2.64 (3H, s, CH_3 -phenyl), 3.84 (3H, s, $-OCH_3$)
4.28 (2H, t, $-OCH_2-$)

Example 12

15 5-[2-(2-Ethoxyphenoxy)ethylamino]ethyl-2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

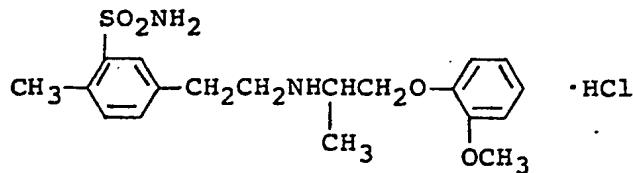
15 Melting point: 180-181.5°C

Elemental analysis for $C_{19}H_{26}N_2O_4S \cdot HCl$:

	C(%)	H(%)	N(%)
Calculated:	55.00	6.56	6.75
Found:	54.81	6.56	6.89

20 Nuclear magnetic resonance spectra (CD_3OD):

δ : 1.36 (3H, t, $-OCH_2CH_3$), 2.64 (3H, s, CH_3 -phenyl)
4.10 (2H, q, $-OCH_2CH_3$), 4.36 (2H, t, $-OCH_2-CH_2-$)

Example 13

5-[2-(2-Methoxyphenoxy)-1-methylethylamino]ethyl]-2-methylbenzenesulfonamide hydrochloride

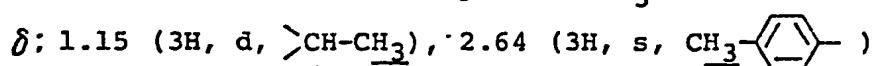
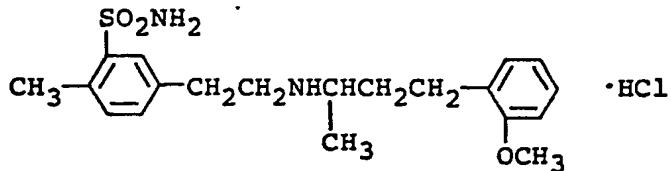
Physicochemical properties:

Melting point: 169-171°C

Elemental analysis for $C_{19}H_{26}N_2O_4S \cdot HCl$:

	C (%)	H (%)	N (%)
Calculated:	55.00	6.56	6.75
Found:	54.89	6.60	6.76

10 Nuclear magnetic resonance spectra (CD_3OD):

Example 14

5-[2-[3-(2-Methoxyphenyl)-1-methylpropylamino]ethyl]-2-methylbenzenesulfonamide hydrochloride

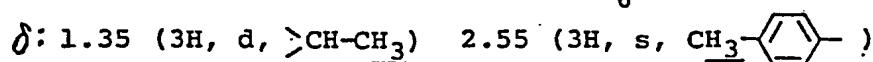
Physicochemical properties:

Melting point: 198-200°C

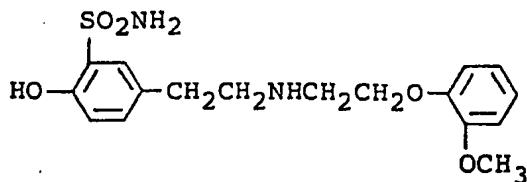
Elemental analysis for $C_{20}H_{28}N_2O_3S \cdot HCl$:

	C (%)	H (%)	N (%)
Calculated:	58.17	7.08	6.78
Found:	58.09	7.01	6.62

15 Nuclear magnetic resonance spectra (d_6-DMSO):



Example 15



2-Hydroxy-5-[2-(2-methoxyphenoxy)ethylamino]ethylbenzenesulfonamide

Physicochemical properties:

Melting point: 97-99°C

Elemental analysis for C₁₇H₂₂N₂O₅S·H₂O :

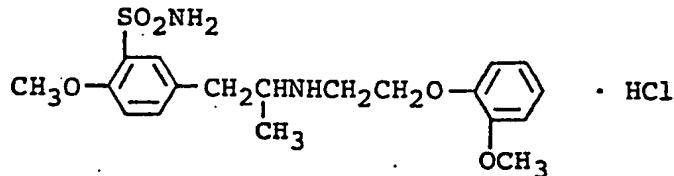
	C(%)	H(%)	N(%)
Calculated:	53.10	6.29	7.29
Found:	52.75	6.22	7.09

Nuclear magnetic resonance spectra (d₆-DMSO):

δ: 3.76 (3H, s, -OCH₃)

4.04 (2H, t, -OCH₂-)

Example 16



2-Methoxy-5-[2-(2-methoxyphenoxy)ethylamino]-2-methylethylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: above 250°C

Elemental analysis for C₁₉H₂₆N₂O₅S·HCl :

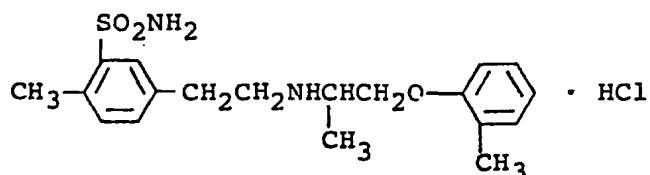
	C(%)	H(%)	N(%)
Calculated:	52.96	6.31	6.50
Found:	52.44	6.31	6.47

Nuclear magnetic resonance spectra (d₆-DMSO) :

δ 1.15 (3H, d, >CH-CH₃)

3.78 and 3.90 (3H + 3H, s, -OCH₃)

4.38 (2H, t, -OCH₂-)

Example 17

2-Methyl-5-[2-[2-(2-methylphenoxy)-1-methylethylamino]ethyl]benzenesulfonamide hydrochloride

Physicochemical properties:

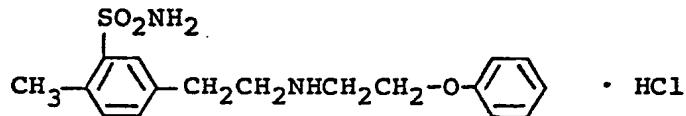
Melting point: 183-185°C

Elemental analysis for C₁₉H₂₆N₂O₃S·HCl:

	C (%)	H (%)	N (%)
Calculated:	57.20	6.82	7.02
Found:	57.13	6.79	6.99

Nuclear magnetic resonance spectra (CD₃OD):

δ : 1.55 (3H, d, >CH-CH₃) 2.24 (3H, s, O-C₆H₄-CH₃)
 2.64 (3H, s, CH₃-C₆H₄-C)
 2.08-2.40 (2H, m, -OCH₂-)

Example 18

2-Methyl-5-[2-(2-phenoxyethylamino)ethyl]benzenesulfonamide hydrochloride

Physicochemical properties:

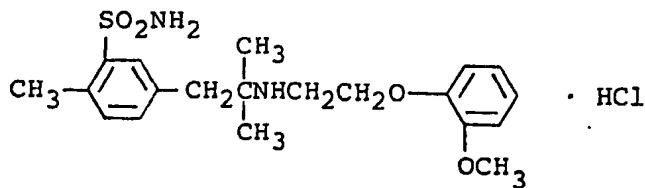
Melting point: 208.5-210°C

Elemental analysis for C₁₇H₂₂N₂O₃S·HCl:

	C (%)	H (%)	N (%)
Calculated:	55.05	6.25	7.55
Found:	54.83	6.23	7.48

Nuclear magnetic resonance spectra (CD₃OD):

δ : 2.65 (3H, s, CH₃-C₆H₄-)
 4.32 (2H, t, -OCH₂-)

Example 19

5- $\{2-[2-(2\text{-Methoxyphenoxy})ethylamino]-2,2\text{-dimethylethyl}\}$ -2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

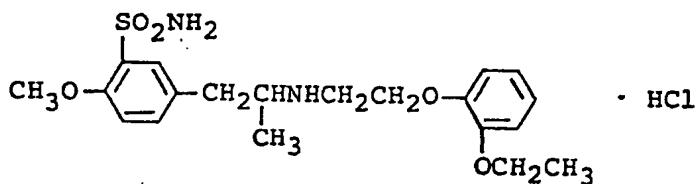
5 Melting point: 199-202°C

Elemental analysis for $C_{20}H_{28}N_2O_4S \cdot HCl \cdot CH_3OH$:

	C(%)	H(%)	N(%)
Calculated:	54.71	7.21	6.08
Found:	54.50	7.17	6.14

10 Nuclear magnetic resonance spectra (d_6 -DMSO):

δ : 1.24 (6H, s, $-\overset{|}{C}-CH_3$), 2.56 (3H, s, $\langle \text{C}_6H_4 \rangle -CH_3$)
3.74 (3H, s, $\langle \text{C}_6H_4 \rangle -OCH_3$), 4.30 (2H, t, $-CH_2-O-$)

Example 20

15 5- $\{2-[2-(2\text{-Ethoxyphenoxy})ethylamino]-2\text{-methylethyl}\}$ -2-methoxybenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 254-256°C

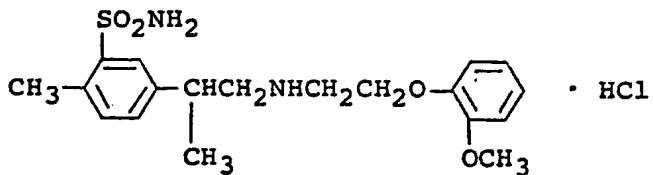
Elemental analysis for $C_{20}H_{28}N_2O_5S \cdot HCl$:

	C(%)	H(%)	N(%)
Calculated:	53.99	6.57	6.30
Found:	53.79	6.58	6.26

20 Nuclear magnetic resonance spectra (CD_3OD):

δ : 1.28 (3H, d, $>CH-CH_3$), 1.38 (3H, t, CH_2-CH_3)
3.97 (3H, s, $O-CH_3$), 4.30 (2H, t, CH_2-CH_2-O)

Example 21



5-[2-(2-Methoxyphenoxy)ethylamino]-1-methylethyl 2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 183-185°C

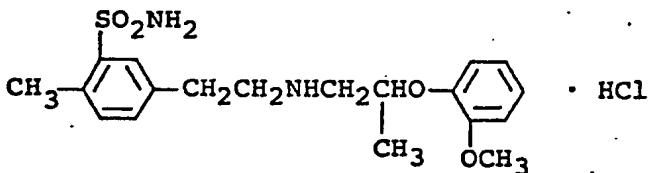
Elemental analysis for $C_{19}H_{26}N_2O_4S \cdot HCl$:

	C (%)	H (%)	N (%)
Calculated:	55.00	6.56	6.75
Found:	54.76	6.56	6.74

Nuclear magnetic resonance spectra (CD_3OD):

δ : 1.40 (3H, d, >CH-CH_3), 2.64 (3H, s, $\text{<img alt="hexagon with CH3" style="vertical-align: middle; height: 1em;"/}$), 3.80 (3H, s, $\text{<img alt="hexagon with OCH3" style="vertical-align: middle; height: 1em;"/}$), 4.23 (2H, t, $\text{-CH}_2\text{-O-}$)

Example 22



5-[2-(2-Methoxyphenoxy)-2-methylethylamino]ethyl 2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 231-232°C

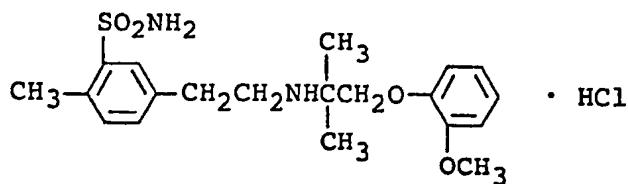
Elemental analysis for $C_{19}H_{26}N_2O_4S \cdot HCl$:

	C (%)	H (%)	N (%)
Calculated:	55.00	6.56	6.75
Found:	54.86	6.58	6.83

Nuclear magnetic resonance spectra (CD_3OD):

δ : 1.26 (3H, d, >CH-CH_3), 2.60 (3H, s, $\text{<img alt="hexagon with CH3" style="vertical-align: middle; height: 1em;"/}$), 3.76 (3H, s, $\text{<img alt="hexagon with OCH3" style="vertical-align: middle; height: 1em;"/}$), 4.42 (1H, m, $\text{CH}_3\text{-CH-O-}$)

Example 23



5-[2-(2-Methoxyphenoxy)-1,1-dimethylethylamino]ethyl 2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 191-193°C

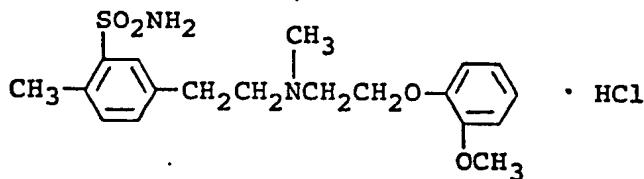
Elemental analysis for C₂₀H₂₈N₂O₄S·HCl:

	C(%)	H(%)	N(%)
Calculated:	56.00	6.81	6.53
Found:	55.83	6.86	6.32

Nuclear magnetic resonance spectra (d₆-DMSO):

δ: 1.44 (6H, s, N-C(CH₃)₂-C), 2.56 (3H, s,),
3.66 (3H, s, , 4.08 (2H, s, -CH₂-O)

Example 24



5-[N-[2-(2-Methoxyphenoxy)ethyl]-N-methylamino]ethyl 2-methylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 169-171°C

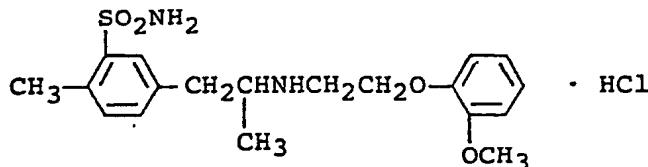
Elemental analysis for C₁₉H₂₆N₂O₄S·HCl:

	C(%)	H(%)	N(%)
Calculated:	55.00	6.56	6.75
Found:	54.88	6.51	6.64

Nuclear magnetic resonance spectra (d₆-DMSO):

δ: 2.56 (3H, s, , 3.68 (3H, s, ,
4.39 (2H, t, -CH₂-O)

Example 25



5- $\{2\text{-}\{2\text{-}\left(2\text{-Methoxyphenoxy}\right)\text{ethylamino}\}\text{-}2\text{-methylethyl}\}\text{-}2\text{-}$
methylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 250-252°C

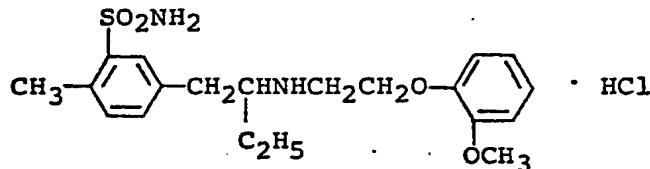
Elemental analysis for C₁₉H₂₆N₂O₄S·HCl:

	C (%)	H (%)	N (%)
Calculated:	55.00	6.56	6.75
Found:	54.68	6.49	6.58

10 Nuclear magnetic resonance spectra (CDCl₃ + d₆-DMSO + D₂O + Na₂CO₃):

δ : 1.06 (3H, d, >CHCH₃), 2.61 (3H, s, CH₃-),
3.76 (3H, s, -OCH₃)

Example 26



15 5- $\{2\text{-}\{2\text{-}\left(2\text{-Methoxyphenoxy}\right)\text{ethylamino}\}\text{-}2\text{-ethylethyl}\}\text{-}2\text{-}$
methylbenzenesulfonamide hydrochloride

Physicochemical properties:

Melting point: 198-200°C

Elemental analysis for C₂₀H₂₈N₂O₄S·HCl:

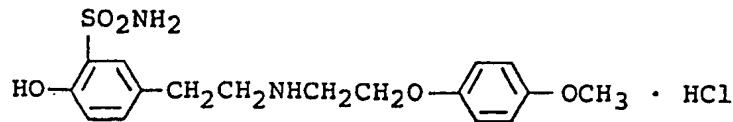
	C (%)	H (%)	N (%)
Calculated:	56.00	6.81	6.53
Found:	55.76	6.88	6.51

20 Nuclear magnetic resonance spectra (CDCl₃ + d₆-DMSO + D₂O + Na₂CO₃):

25 δ : 0.94 (3H, t, >CHCH₂CH₃), 1.22 (2H, m, >CHCH₂CH₃),
2.56 (3H, s, CH₃-, 3.76 (3H, s, -OCH₃)

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Example 27



2-Hydroxy-5-{2-[2-(4-methoxyphenoxy)ethylamino]ethyl}-
benzenesulfonamide hydrochloride

Physicochemical properties:

5 Melting point: 237-241°C (decomposed)

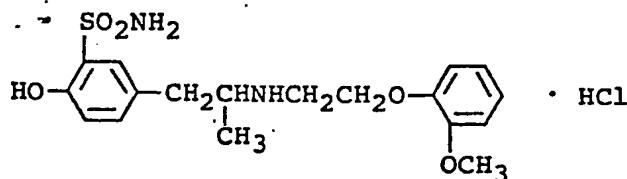
Elemental analysis for C₁₇H₂₂N₂O₅S·HCl:

	C (%)	H (%)	N (%)
Calculated:	50.68	5.75	6.95
Found:	50.45	5.64	6.99

10 Nuclear magnetic resonance spectra (CD₃OD):

δ : 3.74 (3H, s, O-CH₃), 4.22 (2H, t, -CH₂-O)

Example 28



2-Hydroxy-5-{2-[2-(2-methoxyphenoxy)ethylamino]-2-
methylethyl}benzenesulfonamide hydrochloride

15 Physicochemical properties:

Melting point: 211 - 214°C

Elemental analysis for C₁₈H₂₄N₂O₅S·HCl:

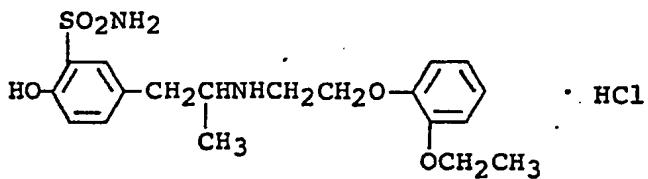
	C (%)	H (%)	N (%)
Calculated:	51.86	6.04	6.72
Found:	51.72	6.00	6.59

20 Nuclear magnetic resonance (CD₃OD):

δ : 1.28 (3H, d, >CHCH₃), 3.86 (3H, s, -OCH₃)

4.30 (2H, t, -CH₂-O)

Example 29



5- $\{2-[2-(2\text{-Ethoxyphenoxy})ethylamino]2\text{-methylethyl}\}-2\text{-}$

hydroxybenzenesulfonamide hydrochloride

Physicochemical properties:

5 Melting point: 172 - 173°C

Elemental analysis for C₁₉H₂₆N₂O₅S.HCl:

	C (%)	H (%)	N (%)
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Calculated:	52.96	6.31	6.50
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Found:	52.83	6.65	6.12
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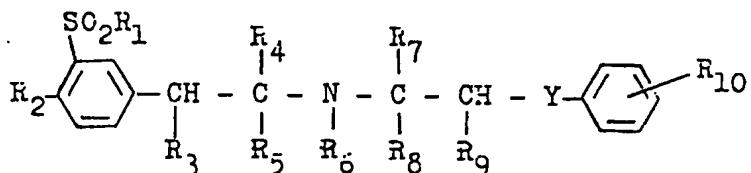
10 Nuclear magnetic resonance spectra (CD₃OD):

1.26 (3H, d, >CHCH₃), 1.36 (3H, t, -CH₂CH₃)

4.10 (2H, q, -CH₂CH₃), 4.26 (2H, t, -CH₂CH₂-O)

C L A I M S :

1. A sulfamoyl-substituted phenethylamine derivative represented by the general formula



wherein R_1 represents an amino group or a mono- or di-lower alkylamino group; R_2 represents a hydroxyl group, a lower alkyl group, or a lower alkoxy group; R_3 represents hydrogen, halogen, a lower alkyl group, a lower alkoxy group, a phenylthio group, or a phenylsulfinyl group; R_4 , R_5 , R_6 , R_7 , R_8 , and R_9 are selected independently from hydrogen and lower alkyl groups; R_{10} represents hydrogen, a lower alkyl group, or a lower alkoxy group; and Y represents oxygen or a methylene group and is oxygen when R_2 is a hydroxyl group; or a salt thereof.

2. A compound according to claim 1 wherein R_3 is hydrogen or a lower alkyl group.

3. $5-\{2-\text{[2-(2-ethoxy-phenoxy)ethylamino]7-2-methylethyl}\}-2\text{-methoxybenzenesulfonamide.}$

4. $2\text{-methoxy-5-\{2-\text{[2-(2-methoxyphenoxy)ethylamino]7-2-methylethyl}\}benzenesulfonamide.}$

5.

$5-\{2-\text{--}2-(2\text{-methoxyphenoxy})ethylamino\text{--}2\text{-methylethyl}\}-2\text{-methylbenzenesulfonamide.}$

6.

$5-\{2-\text{--}2-(2\text{-methoxyphenoxy})ethylamino\text{--}ethyl\}-2\text{-methylbenzenesulfonamide}$

or

$| 2\text{-methoxy-}5-\{2-\text{--}2-(2\text{-methoxyphenoxy})ethylamino\text{--}2\text{-methylethyl}\}-N\text{-methylbenzenesulfonamide}$

or

$2\text{-methoxy-}5-\{2-\text{--}2-(2\text{-methoxyphenoxy})ethylamino\text{--}2\text{-methylethyl}\}-N,N\text{-dimethylbenzenesulfonamide.}$

7.

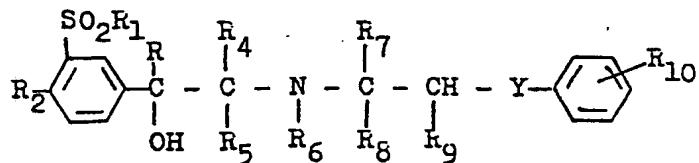
A salt of a compound according to any of claims 3 to 6.

8.

A pharmaceutical composition containing a compound according to any preceding claim and an excipient.

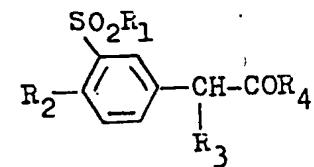
9.

A process of producing a compound according to claim 1 which comprises reacting a compound represented by the general formula

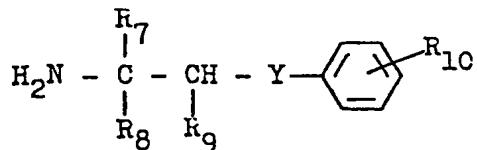


wherein R represents hydrogen or a lower alkyl group and R₁, R₂, R₄, R₅, R₆, R₇, R₈, R₉, R₁₀, and Y are as defined in claim 1 with halogenating agent and then, if desired, a) reducing the halogenated product; or b) reacting the halogenated product with a lower alcohol or thiophenol and, if desired, oxidizing the product obtained by the reaction with thiophenol; or c) reacting the halogenated product with alkaline material and then reacting the product thus obtained with hydrogen iodide, a lower alcohol, or thiophenol, and if desired, oxidizing the product obtained by the reaction with thiophenol.

10. A process of producing a compound according to claim 1, wherein R₅ and R₆ are hydrogen, which comprises condensing a compound represented by the general formula



with a compound represented by the general formula



wherein R₁, R₂, R₃, R₄, R₇, R₈, R₉, R₁₀ and Y are as defined in claim 1 and then reducing the condensation product.